2003

Generalized Geologic Map for Land-Use Planning: Butler County, Kentucky

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Lock No. 3 on the Green River during high flow. The Green River pool level is maintained by the dam at Lock No. 3. This pool is the primary source of drinking water for the entire county.

Green River flooding an early corn crop. (Photo courtesy of Greg Drake, Butler County Agriculture and Natural Resources Agent.)

An earthen levy was constructed around this low-lying row-crop field to hold back floodwater from the Green River.

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Additional Planning Resources

Listed below are Web sites for several agencies and organizations that may be of assistance with landuse planning issues in Butler County:

http://www.morgantownbutlerco.com/—Morgantown–Butler County Chamber of Commerce
ces.ca.uky.edu/butler/—University of Kentucky Cooperative Extension Service
www.bradd.org/—Barren River Area Development District
www.thinkkentucky.com/edis/cmnty/cw070/—Kentucky Economic Development Information System
www.uky.edu/KentuckyAtlas/21031.html—Kentucky Atlas and Gazetteer
quickfacts.census.gov/qfd/states/21/21031.html—U.S. Census data
kgsweb.uky.edu/download/kgsplanning.htm—Planning information from the Kentucky Geological Survey

Tar-Sands in Western Kentucky

Investigations by the Kentucky Geological Survey have confirmed that major tar-sand resources are present in western Kentucky (Noger, 1999). In-place resources are calculated to be in excess of 3 billion barrels. The principal formations that contain tar-sand deposits (also referred to as asphaltic sandstones, heavy-oil deposits, or bitumen-impregnated sandstones) are the Kyrock, Bee Springs, Tar Springs, Hardinsburg, and Big Clifty Sandstones. Some of these may occur in Logan, Warren, Butler, Edmonson, Hart, Grayson, Breckinridge, and Hardin counties. In Warren County, tar-sands may be present in unit 4. Photo by Randy Bruner.

For more information information on tar-sands, go to kgsweb.uky.edu/PubsSearching/PubsSimpleSearch.asp, keyword= tar sands.

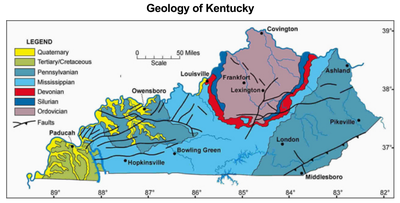
Geologic Hazards

Faults are common geologic structures across Kentucky, and have been mapped in many of the Commonwealth's counties. The faults shown on this map are part of the Pennyrile Fault System, which is not considered to be active. Earthquake damage in Butler County is still a possibility, however. Soil creep, slumps, and landslides along steep slopes may occur from erosion or ground motion associated with a strong earthquake. Areas associated with alluvium (Unit 1) are subject to liquefaction during a strong earthquake. These areas are also subject to flooding. Soils derived from alluvium deposits may have a moderate to high shrink-swell capacity, which may affect structural foundations and roads. Surface coal mine (strip mine) areas are prone to settling after reclamation, which also may affect structural foundations and roads. Strip mine areas also lack soil structure, which inhibits the growth of vegetation during summer months. Strip mine areas are not shown. In areas where coal seams crop out, shallow underground mines may be present. These shallow mines are represented on the map as adits. Localized ground instability may occur because of mine subsidence.

Groundwater Availability

In the northern two-thirds of Butler County most wells less than 300 ft deep are adequate for a domestic supply. Wells located in the Green River floodplain can produce as much as 100 gal/min of hard water. Most wells obtain their water from thick sandstone layers and will yield as much as 60 gal/min. In the southern third of the county only a few wells yield enough water for a domestic supply. In the central section of the county moderately mineralized water may be obtained locally from deep sandstone formations at depths of 1,200 ft. Generally, groundwater is hard to very hard, and iron and salt may be present in objectionable amounts. Often groundwater becomes saltier with depth. For more information about groundwater resources in the county, see Carey and Stickney (2001).

Geology of Kentucky



Learn more about Kentucky geology at www.uky.edu/KGS/geoky/

For information on obtaining copies of this map and other Kentucky Geological Survey maps and publications call:

Public Information Center
859.257.3896
877.778.7827 (toll free)

View the KGS World Wide Web site at:
www.uky.edu/kgs

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Scale 1:63,360

1 inch equals 1 mile

3 0 3 6 Miles

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Acknowledgments

Bedrock mapping was adapted from Mullins (2002a-g), Plauche (2002), Smith (2002), Thompson (2002), Thompson and Toth (2002), Thompson and others (2002), and Toth (2002a-d). Sinkhole data supplied by R.L. Paylor, L.J. Florea, M.J. Caudill, and J.C. Currens. Photographic assistance was provided by Greg Drake, Agriculture and Natural Resources Agent. Thanks to Richard Smath, Kentucky Geological Survey, for information on tar-sands.

Butler County is dominated by the Caseyville Hills ecoregion (Woods and others, 2002), which is characterized by uplands with steep slopes (left) and broad, flat lowlands (right).

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KGS

MAP AND CHART 61

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For Planning Use Only

This map is not intended to be used for selecting individual sites. Its purpose is to inform land-use planners, government officials, and the public in a general way about geologic bedrock conditions that affect the selection of sites for various purposes. The properties of thick soils may supercede those of the underlying bedrock and should be considered on a site to site basis. At any site, it is important to understand both the soils and the underlying rock. For further assistance, contact the Kentucky Geological Survey, Henderson Office, 1401 Corporate Drive, Henderson, KY 42420, phone 270.827.3414 or 827.3404

An example of how water-retaining fill material destabilized part of the William H. Natcher Parkway in Butler County. Upon saturation, the original fill material, consisting of Unit 3 (see table), became unstable and caused a landslide that created a large breach in the parkway.

Source-Water Protection Areas

Source-water protection areas are those in which activities are likely to affect the quality of the drinking-water source. For more information, see kgsweb.uky.edu/download/water/swapp/swapp.htm.

EXPLANATION

- School
- Spring
- Domestic water well
- Agricultural water well
- Water monitoring well
- Public water well
- Gas well
- Oil and gas well
- Class II injection well
- Dry and abandoned well
- Mine shaft
- Mine adit
- Quarry
- Source-water protection area, zone 1
- Wetlands > 1 acre (U.S. Fish and Wildlife Service, 2003)
- Incorporated city boundaries
- Watershed boundary
- Artificial fill
- Mapped sinkholes
- Concealed fault
- Fault
- 50-foot contour interval

The Yukon Valley Minerals limestone quarry is the only active quarry in Butler County. Approximately 30 ft of overburden is being removed to mine the Glen Dean Limestone, which is approximately 25 ft thick at this location.

Approximately 10 percent of Butler County consists of reclaimed surface coal mine land (above). There are currently no active surface or deep coal mines in Butler County.

Definitions

FOUNDATION AND EXCAVATION
The terms "earth" and "rock excavation" are used in the engineering sense; earth can be excavated by hand tools, whereas rock requires heavy equipment or blasting to remove. The term "rippable" means excavation by a ripper attachment on a bulldozer.

LIMITATIONS
Slight -- A slight limitation is one that commonly requires some corrective measure but can be overcome without a great deal of difficulty or expense.

Moderate -- A moderate limitation is one that can normally be overcome but the difficulty and expense are great enough that completing the project is commonly a question of feasibility.

Severe -- A severe limitation is one that is difficult to overcome and commonly is not feasible because of the expense involved.

LAND USES
Septic tank disposal system -- A septic tank disposal system consists of a septic tank and a filter field. The filter field is a subsurface tile system laid in such a way that effluent from the septic tank is distributed with reasonable uniformity into the natural soil.

Residences -- Ratings are made for residences with and without basements because the degree of limitation is dependent upon ease and required depth of excavation. For example, excavation in limestone has greater limitation than excavation in shale for a house with a basement.

Highways and streets -- Refers to paved roads in which cuts and fills are made in hilly topography, and considerable work is done preparing subgrades and bases before the surface is applied.

Access roads -- These are low-cost roads, driveways, etc., usually surfaced with crushed stone or a thin layer of blacktop. A minimum of cuts and fills are made, little work is done preparing a subgrade, and generally only a thin base is used. The degree of limitation is based on year-around use and would be less severe if not used during the winter and early spring. Some types of recreation areas would not be used during these seasons.

Light industry and malls -- Ratings are based on developments having structures or equivalent load limit requirements of three stories or less, and large paved areas for parking lots. Structures with greater load limit requirements would normally need footings in solid rock, and the rock would need to be core drilled to determine presence of caverns, cracks, etc.

Intensive recreation -- Athletic fields, stadiums, etc.

Extensive recreation -- Camp sites, picnic areas, parks, etc.

Reservoir areas -- The floor of the area where the water is impounded. Ratings are based on the permeability of the rock.

Reservoir embankments -- The rocks are rated on limitations for embankment material.

Underground utilities -- Included in this group are sanitary sewers, storm sewers, water mains, and other pipes that require fairly deep trenches.

Planning Guidance by Rock Unit Type

Rock Unit	Foundation and Excavation	Septic Tank Disposal System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Alluvium	Fair to good foundation material. Easily excavated.	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).	Refer to soil report (Mitchell, 2001).
2. Gravel deposits	Fair to good foundation material on hilltops, poor foundation material on hillslopes; easily excavated.	Slight to moderate limitations. Variable thickness and permeability.	Moderate to severe limitations.	No limitations.	No limitations.	No limitations.	No limitations.	No limitations.	Moderate to severe limitations.	Moderate to severe limitations.	No limitations.
3. Shale, siltstone, limestone, sandstone, coal, underclay, and conglomerate	Fair to good foundation material; difficult to excavate.	Severe limitations; thin soils and impermeable rock.	Severe to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes.	Moderate limitations. Rock excavation. Steep slopes.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes.	Severe limitations. Steep slopes.	Slight to moderate limitations.	Slight limitations. Reservoir might leak where rocks are fractured.	Severe limitations.	Moderate limitations. Highly variable amount of rock and earth excavation.
4. Sandstone, shale and limestone	Fair to good foundation material; difficult to excavate.	Severe limitations; thin soils and impermeable rock.	Severe to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Steep to moderate slopes.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep to moderate slopes. Swelling clays may be present.	Moderate limitations. Rock excavation. Steep to moderate slopes. Swelling clays may be present.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep to moderate slopes. Swelling clays may be present.	Severe to moderate limitations. Steep to moderate slopes.	Slight to moderate limitations.	Slight limitations. Reservoir might leak where rocks are fractured.	Severe limitations.	Moderate limitations. Highly variable amount of rock and earth excavation.
5. Limestone and shale	Fair to good foundation material; difficult to excavate.	Severe limitations; thin soils and impermeable rock.	Moderate limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes present along major drainages.	Moderate limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes along major drainages. Swelling clays may be present.	Minor limitations. Rock excavation. Steep slopes along major drainages. Swelling clays may be present.	Minor limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes along major drainages. Swelling clays may be present.	Moderate limitations. Steep to moderate slopes.	Slight limitations.	Slight limitations. Reservoir might leak where rocks are fractured.	Severe limitations.	Moderate limitations. Possibility of thin soils and rock excavation.
6. Limestone	Excellent foundation material; difficult to excavate.	Severe limitation. Impermeable rock. Locally fast drainage through fractures; danger of groundwater contamination.	Severe to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Sinks common; drainage required.	Slight to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Sinks common; local drainage problems.	Slight limitations. Local drainage problems from seeps or springs; sinks common.	Slight to moderate limitations, depending on topography. Rock excavation; locally, upper few feet may be rippable. Sinks common; local drainage problems.	Moderate limitations. Steep slopes.	Slight limitations.	Slight limitations. Reservoir might leak where rocks are fractured.	Severe limitations.	Moderate limitations. Possibility of thin soils and rock excavation.
7. Sandstone	Fair to good foundation material; difficult excavation.	Severe limitations. Thin soils.	Severe to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes.	Severe limitations. Rock excavation, locally, upper few feet may be rippable. Steep slopes.	Moderate limitations. Rock excavation. Steep slopes.	Severe limitations. Rock excavation. Steep slopes.	Severe limitations. Steep slopes.	Slight to moderate limitations.	Moderate limitations. Permeable rock.	Severe limitations.	Moderate limitations. Highly variable amount of soil and rock excavation. Steep slopes.